Chesapeake Bay Program
SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE
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James Edward
Acting Director of the Chesapeake Bay Program
US Environmental Protection Agency
410 Severn Ave., Suite 109
Annapolis, MD 21403

Dear Mr. Edward,

The Chesapeake Bay Program's (CBP) Scientific and Technical Advisory Committee (STAC) recently joined members of the Chesapeake Community Modeling Program (CCMP) to host a workshop to review and discuss state-of-the-art coastal and estuarine hydrodynamic models. One of the workshop's goals was to provide input to the Chesapeake Bay modeling workgroup that could be used to inform the selection of a future hydrodynamic model or model ensemble for assessing water quality and living resource management impacts. While the results from this workshop will certainly be useful in that future task, they are also particularly timely and relevant when considering them in conjunction with the National Academy of Sciences (NAS) report titled, "Achieving Nutrient and Sediment Reduction Goals in the Chesapeake Bay: An Evaluation of Program Strategies and Implementation." Thus, STAC strongly recommends the CBP consider the workshop steering committee's list of recommendations provided below as it prepares a response to the NAS report:

1) **Use multiple models.** The workshop showed that multiple hydrodynamic models provide more insight into system behavior and more confidence in model output than any one hydrodynamic model in isolation. Additionally, an estimate of uncertainty can be derived from the multiple model outputs and subsequent mean and variability about that mean. Although the workshop focused mainly on hydrodynamic models, these conclusions should hold for other categories of models as well, including watershed models and water quality models. The consensus among workshop participants was that the CBP should migrate to using an ensemble of multiple models in their assessment process.

2) **Use open source community models.** The workshop highlighted the sizable communities which have organically formed in support of several scientifically vetted, open source estuarine hydrodynamics models. Analogous communities are forming in support of open source watershed and water quality models. As a result of the many and diverse researchers invested in community models, such models are more likely to adopt advantageous new computational approaches, potential model errors are more likely to be identified, and the general confidence in such models tends to be higher.

3) **Assess model skill.** It is crucial that the CBP use scientifically vetted models with quantitatively demonstrated skill. The workshop showed it is relatively easy to systematically evaluate and compare the skill of multiple Chesapeake Bay hydrodynamic and hypoxia models, as long as the output is easily accessible. All present and future CBP

models should be openly and quantitatively assessed by the scientific community. The metrics utilized in the workshop provide one option while additional, useful metrics are available in the published literature. Any new models chosen to supplement or replace existing CBP models should demonstrate skill at least similar to the existing CBP models.

4) **Implement models in a modular fashion.** An obstacle to the familiarity, use, and testing of CBP models by the larger community has been the inability of non-CBP researchers to run CBP models themselves or to link them with other models. A recommended solution to this problem is to "modularize" both present CBP models and other models that may be adopted by the CBP in the future. The modularized components could then be easily interchanged within a community-supported testbed by modelers both inside and outside CBP. In this fashion, various ensembles of watershed, hydrodynamic, water quality and other models could be more easily compared and tested.

5) **Form a Chesapeake Modeling Laboratory to enable the above.** The Chesapeake Modeling Laboratory (CML) suggested in the NAS report is a logical mechanism for carrying out the above recommendations. Given the current budget climate, however, a "brick and mortar" laboratory seems unlikely. The consensus of the workshop was to build off the existing community modeling infrastructure that is already focused on the Bay region in order to, at a minimum, form a permanently funded, virtual CML. A key role of the CML would be to utilize scientific expertise, both inside and outside the CBP, to explore, expand, and vet future CBP models to be used to set total maximum daily load (TMDL) allocations. In the short-term an *ad-hoc* modeling advisory committee sanctioned by, but external to, the CBP should be formed to advise CBP on future modeling activities.

The workshop steering committee will also complete a STAC workshop report in the coming weeks that will include the above recommendations as well as additional details taken from the two-day meeting. STAC looks forward to continuing its work with the CBP Partnership and the CBP modeling workgroup to select and develop the most appropriate, state-of-the-art models for future CBP modeling needs.

Sincerely,

Chris Pyke,
Chair of the Chesapeake Bay Program's Scientific and Technical Advisory Committee